United States
Environmental Protection
Agency

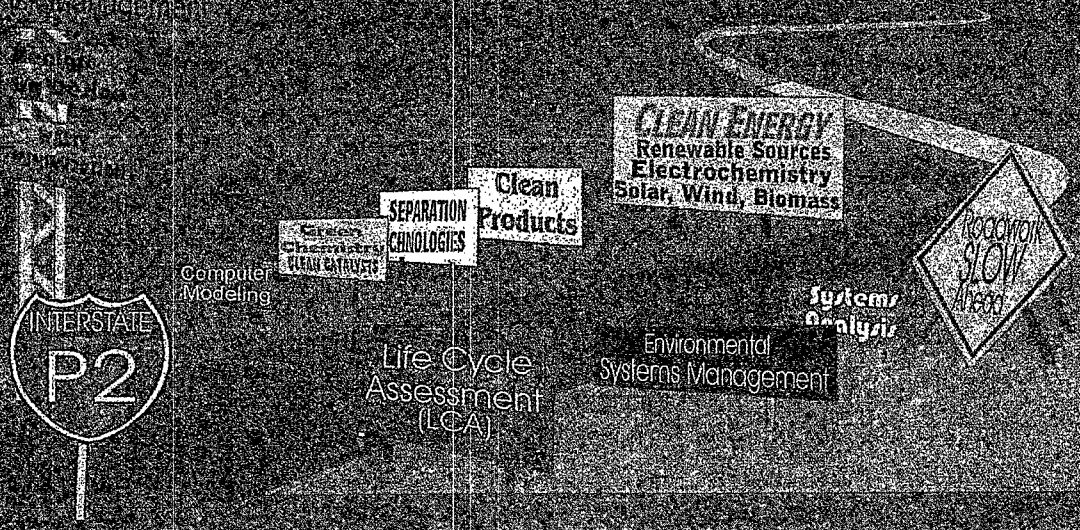
Office of Research and
Development
Washington DC 20460

EPA/600/F-01/019

# EPA Sustainable Technology Division

## Promoting Cleaner Technologies and Tools for a Sustainable Environment

The Road To Sustainability




NRMRL

National Risk Management Research Laboratory

# The Sustainable Technology Division (STD)

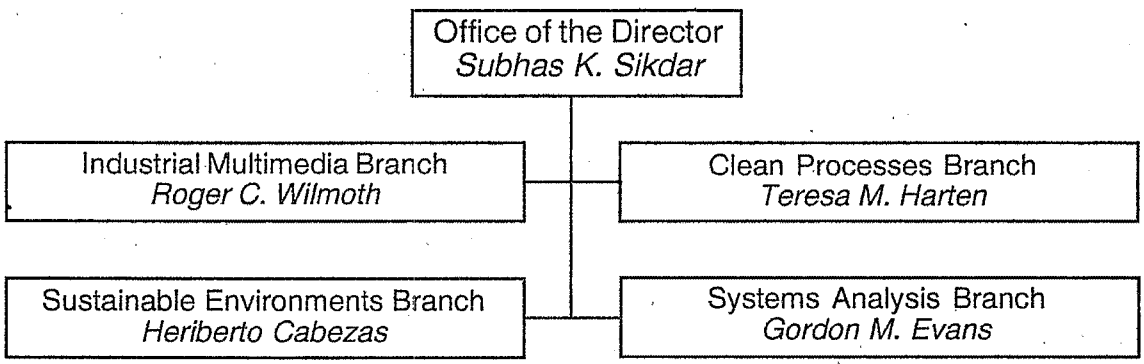
## Mission

To advance the scientific understanding, development and application of technologies and methods for prevention, removal and control of environmental risks to human health and ecology.

The Sustainable Technology Division is one of six divisions within the National Risk Management Research Laboratory located in Cincinnati, Ohio. There are four branches within STD that plan, coordinate, and conduct a national program of multimedia research, development, and demonstration of cleaner technologies and tools for integrated pollution management for industrial processes. Our priority is to reduce or eliminate the generation of hazardous, toxic and other pollutant waste through pollution prevention.

The Division conducts program activities through a variety of mechanisms including: in-house research, cooperative agreements with academia and nonprofit organizations, interagency agreements with other federal entities, cooperative research and development agreements with the private sector under the Federal Technology Transfer Act of 1986, and contracts with environmental consultants and for-profit companies.

## Sustainable Technology Division




Division Director: Subhas K. Sikdar
Email: sikdar.subhas@epa.gov
Phone: 513-569-7528 / Fax: 513-569-7787

# Clean Processes Branch

The mission of the Clean Processes Branch (CPB) is to develop and demonstrate clean technologies for pollution prevention, recycling and reuse, and to estimate their environmental consequences through industrial ecology approaches such as life cycle assessment. In addition, an effort to make findings place-based at the watershed and community level are incorporated where possible. The major research emphases are as follows:

## Green Chemistry and Engineering for Chemical Synthesis

Pollution prevention (P2) alternatives for the chemical process industry are being investigated through in-house projects. Improvements to oxidation chemistry using better catalysts and photo oxidation processes have been our original areas of interest. In addition, alternative solvents such as water, carbon dioxide and ionic liquids are being explored for improved synthesis efficiency and environmental benefits. Alternative energy sources for chemical synthesis such as microwave, solar and sonication are also the subjects of investigation. Chemists and chemical engineering staff work closely to make early determinations as to the feasibility of scaled-up processes.

## Pervaporation for Organics Recovery

Membranes for Pervaporation: Bench- and pilot-scale demonstrations of solvent and other organics recovery from liquid streams are the objectives of this in-house research program. Understanding the role of fundamental variables affecting the process as well as the practical application of the technology in industrial P2 settings are goals. Recovery of alcohols is an active area of pursuit and it is expected that improvements in pervaporation technology for this purpose will have positive implications for its use in bioprocessing industries. Predictive software to assist in identifying opportunities for using the technology has also been developed with EPA and other pervaporation databases.

### Key Research Area Contacts

| | |
|---|---|
| Green Chemistry and Engineering for Chemical Synthesis: | Rajender Varma, varma.rajender@epa.gov<br>Endalkachew Sahle-Demessie, sahle-demessie.endalkachew@epa.gov<br>Michael Gonzalez, gonzalez.michael@epa.gov |
| Pervaporation for Organics Recovery: | Leland Vane, vane.leland@epa.gov<br>Franklin Alvarez, alvarez.franklin@epa.gov |
| Pervaporation Prediction Software: | Johnny Springer, Jr., springer.johnny@epa.gov |

Branch Chief: Teresa M. Harten
Email: harten.teresa@epa.gov
Phone: 513-569-7565/Fax: 513-569-7677

# Sustainable Environments Branch

The mission of the Sustainable Environments Branch (SEB) is to construct a strategy for sustainable environmental systems management using economics on approaches, water resource and land use planning, physical and ecological theory, law, technological methods and knowledge implemented through computer based tools, and field data and human experience to reduce risks to human health and the ecology. The major technical areas encompassed within the mission are:

## Environmental Economics

Design and analysis of market approaches for environmental systems management including a program of tradable credits for management of environmental stressors. Applications to impervious surface for controlling urban storm water runoff, with a focus on stream quality and combined sewer overflows, a serious problem in many regions.

## Sustainable Systems Theory

Construction of a basic theory of sustainable systems using principles from ecology, physics, law, and economics to uncover the underlying principles of sustainable systems, and provide guidance on the viability of different environmental systems management strategies.

## Law

Analysis of the interface between law identification of and sustainability to identify legal methods or avenues for establishing sustainable practices; law as a process, equal to and intertwined with physical, chemical, economic, and other social processes involved in sustainability; and consideration of law and other behavioral aspects of society as potential stressors that affect sustainability.

## Hydrology & Land Use

Development of a GIS-linked hydrologic impact assessment and decision support tool; development of methodologies for creating multi-scale land use classifications from disparate remote sensing data; and development of correlations linking hydrologic impacts to measurable ecological indicators.

## Sustainable Technology

Evaluation and design of new sustainable technologies using Life Cycle approaches and other risk management analysis methodology to assist the development of sustainable technology systems and stimulate the invention of new technological approaches.

## Key Research Area Contacts

| | |
|---|---|
| Environmental Economics: | Haynes C. Goddard, Ph.D., goddard.haynes@epa.gov |
| Sustainable Systems Theory: | Heriberto Cabezas, Ph.D., cabezas.heriberto@epa.gov |
| Law: | Theresa Hoagland, J.D., hoagland.theresa@epa.gov |
| Hydrology & Land Use: | David Szlag, Ph.D., szlag.david@epa.gov |
| Sustainable Technology: | John Glaser, Ph.D., glaser.john@epa.gov |

Branch Chief: Heriberto Cabezas, Jr. Email: cabezas.heriberto@epa.gov
Phone: 513-569-7350/Fax: 513-487-2511

# Systems Analysis Branch

The mission of the Systems Analysis Branch (SAB) is to develop and demonstrate cost-effective decision making tools for use by the private and public sectors. Such tools integrate environmental solutions, life cycle concepts, value engineering, environmental engineering, economics, trade-offs and pollution prevention factors. The major technical areas encompassed within the mission are:

## Cost Engineering

Application of engineering economic principles and cost estimating approaches guide NRMRL research investments in technology. Projects include the survey of costing data and tools that can be applied to making environmental decisions. Cost engineering techniques are developed and applied across the Laboratory, and various costing tools are integrated into private and public sector decision-making. This area strengthens in-house research activities, supports the program and regional offices, and undertakes fundamental research in the areas of interest to the scientific community.

## Life Cycle Assessment (LCA)

The program applies LCA in environmental research through in-house and extramural programs focused on three objectives: developing the conceptual model and methodology for conducting LCA (including efforts to make life cycle data more readily available to LCA practitioners through the development of a web portal called LCAccess); advancing the state-of-the-practice through various forums, such as conferences, workshops, and publications; and employing LCA tools and techniques as support to environmental decision-makers in real world operations. In addition, researchers are closely involved in the international development process, including the International Standards Organization (ISO 14000), the Society for Environmental Toxicology and Chemistry (SETAC) and the United Nations Environment Programme (UNEP).

## Chemical Process Simulation and Measurement

Development and demonstration of computer-based approaches to achieve environmentally beneficial changes in manufacturing processes and products, and measuring the process achieved. Current simulation work includes methods for developing P2 including assessment modules for chemical process simulators and solvent design software. The major projects are:

- Computer Aided Chemical Process Design Methodologies for Pollution Reduction
- Computer Aided Solvent Design for Pollution Prevention: PARIS II
- Chemical Process Simulation for Waste Reduction: WAR Algorithm
- Industrial Ecology Based Hierarchical Process Design

## Environmental Impact Measurement

Impact assessment and measurement focusing on the research, development and application of environmental impact assessment and progress measurement for environmental decision-making. Current projects include development of impact assessment methodologies, tools, and supporting data in the areas of chemical and non-chemical environmental impacts, and the measurement of progress in preventing pollution. The major project in this area is the development of a software tool for environmental impact measurement, called TRACI (Tool for the Reduction and Assessment of Chemical Impacts).

### Key Research Area Contacts

| | |
|---|---|
| Cost Engineering: | John Abraham, abraham.john@epa.gov |
| Life Cycle Assessment: | Mary Ann Curran, curran.maryann@epa.gov |
| Chemical Process Simulation: | Douglas Young, young.douglas@epa.gov |
| Environmental Impact: | Jane Bare, bare.jane@epa.gov |

Branch Chief: Gordon M. Evans
Email: evans.gordon@epa.gov
Phone: 513-569-7684/Fax: 513-569-7111

# Industrial Multimedia Branch

The Industrial Multimedia Branch (IMB) mission is to develop, demonstrate and evaluate timely and integrated innovative engineering and scientific approaches to reduce air, water and land toxic pollution generated by the production, processing, and use of materials. The major research areas for the Industrial Multimedia Branch are:

## Mine Waste Technology Program

The Mine Waste Technology Program evaluates and demonstrates new and innovative technologies for abating the environmental consequences of ore mining and milling activities. This program is a joint effort with the Department of Energy's Western Environmental Technology Office in Butte, Montana. The multimillion-dollar program receives technical direction from the IMB. In addition, the IMB has a significant in-house research program on economical recovery options for metals from the mine waste water in the Berkeley Pit in Montana.

## Technology Verification Work

The Environmental Technology Verification Program (ETV) evaluates the feasibility of a private-sector approach to technology verification in an attempt to reduce the risk to small business of adopting new environmental control processes. The IMB manages the Pollution Prevention Center for the Environmental Technology Verification Program. One of the pilot programs funded under ETV is a private-sector approach administered by the Civil Engineering Research Foundation and overseen by the IMB. Another is the Metal Finishing ETV pilot.

## Metal Finishing CSI Support

The Research and Technology Workgroup of the Metal Finishing Subcommittee of the EPA Common Sense Initiative focuses much of its attention on the development and demonstration of innovative, low-cost technologies designed to improve the performance of the industry and achieve cost-effective pollution prevention with regard to chrome emissions. Also, work is ongoing for the Approaching Zero Discharge project where technologies are evaluated in metal finishing shops. Additionally, the IMB is modifying an airborne risk-prediction computer model for metal finishing to include all media of wastes.

## Lead Paint/Lead Soil Abatement

The NRMRL Lead program focuses on evaluating lead paint abatement and lead in soil removal technologies. This program seeks out the most cost-effective of these technologies without compromising the protection of public health. Proof of concept(s) demonstrations evaluating lead paint abatement technologies have been conducted in and around residential housing in Buffalo, NY, Ravenna, KY, Elgin, IL, and in Butte, MT.

## Base-Decatalyzed Dechlorination

The base-catalyzed decomposition process, a chemical dehalogenation technology developed by NRMRL, is demonstrated by IMB around the world in various pilot-scale and semi-commercial plants.

## Source Reduction Regulatory Program

This research, conducted in direct consultation with the various Common Sense Initiative Industry Subcommittees, focuses on needs within the pulp and paper industry and the industrial laundries industry. The identification of research needs is a collaborative one with inputs from several sources, largely outside the government. The focus of all research conducted in this area is in pollution prevention, i.e., source reduction and/or recycle/reuse with treatment options considered lastly.

## Fuel Cell Environmental Effectiveness Program

This research involves efforts to evaluate the effectiveness of various fuel cell options on a Life Cycle Assessment basis for minimizing environmental impact while providing a cost-effective energy alternative.

### Key Research Area Contacts

| | |
|---|---|
| Mine Waste Technology Program: | Roger C. Wilmoth, wilmoth.roger@epa.gov and Diana Bless, bless.diana@epa.gov |
| Technology Verification Work: | Alva Daniels, daniels.alva@epa.gov and Norma Lewis, lewis.norma@epa.gov |
| Metal Finishing CSI Support: | Dave Ferguson, ferguson.david@epa.gov |
| Lead Paint/Lead Soil Abatement: | Alva Daniels, daniels.alva@epa.gov |
| Base-Decatalyzed Dechlorination: | George Huffman, huffman.george@epa.gov |
| Fuel Cell Program: | George Huffman, huffman.george@epa.gov and Ivars Licis, licis.ivars@epa.gov |
| Pulp and Paper P2 Research Program: | Glenn Shaul, shaul.glenn@epa.gov |
| Computer Modeling: | Paul Harten, harten.paul@epa.gov |

Branch Chief: Roger C. Wilmoth
Email: wilmoth.roger@epa.gov
Phone: 513-569-7509/Fax: 513-569-7471

*To Contact Us*

**Sustainable Technology Division**
**National Risk Management Research Laboratory**
**Office of Research and Development**
**U.S. Environmental Protection Agency**
**26 West Martin L. King Drive**
**Cincinnati, OH 45268**

**Phone: 513-569-7528**
**513-569-7787**

*For More Information*

**http://www.epa.gov/ORD/NRMRL/std**

EPA/600/F-01/019